



Short-term forecasts using NU-WRF for the Winter Olympics 2018

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The Alpensia Ski Center

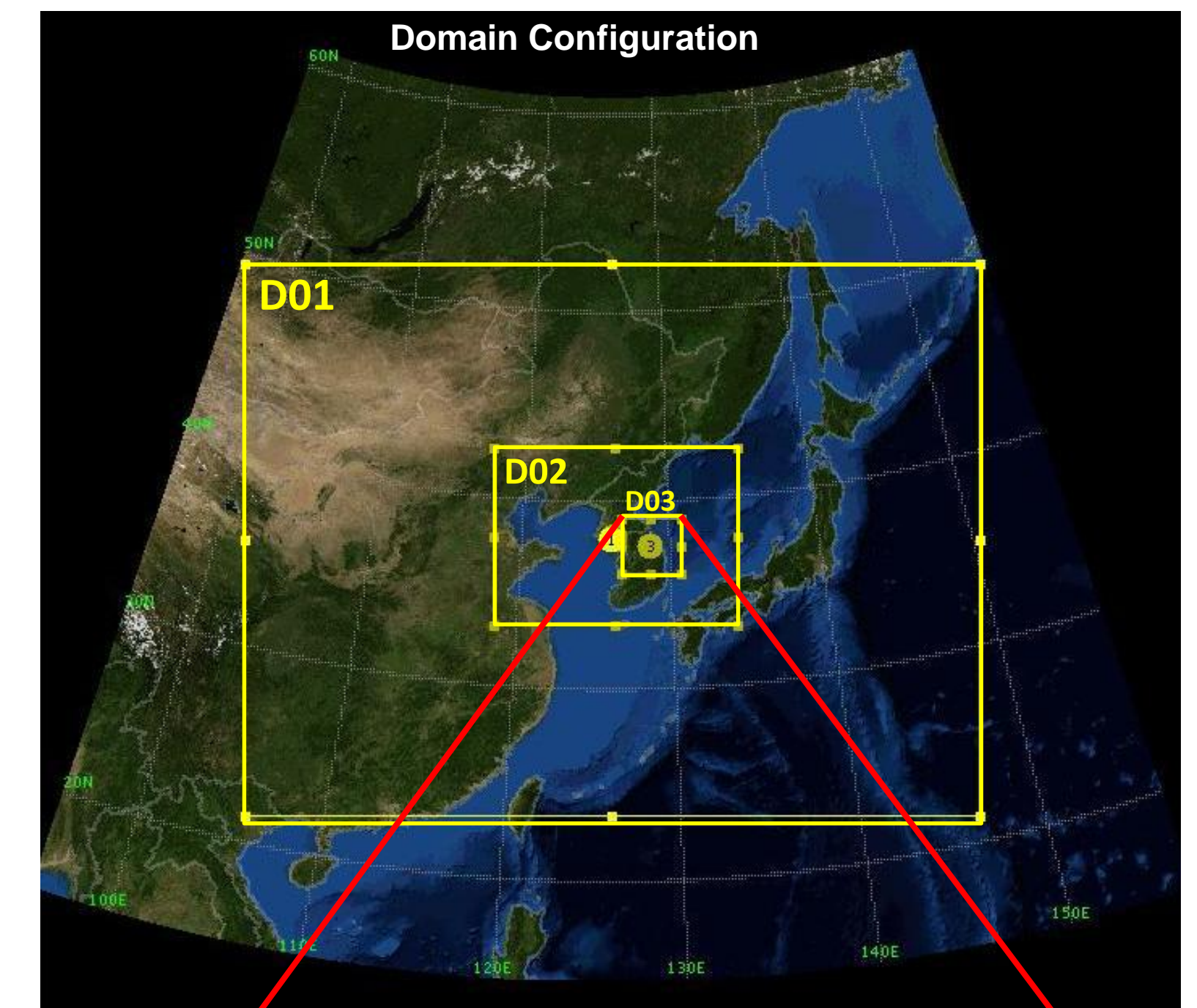


<https://www.nytimes.com/2017/02/14/travel/pyeongchang-south-korea-skiing-2018-winter-olympics.html>

Table 1

Venues of the 2018 Winter Olympics

Site	Lat	Lon
Alpensia Ski Jumping Centre	37.662208	128.680462
Alpensia Biathlon Centre	37.663755	128.687290
Alpensia CrossCountry Ski Centre	37.663897	128.684789
Alpensia Sliding Centre	37.654353	128.681965
Yongpyong Alpine GS Start	37.612989	128.671767
Yongpyong Alpine GS Middle2	37.618446	128.668860
Yongpyong Alpine GS Finish	37.621578	128.664814
Jeongseon Alpine DH Start	37.445418	128.598923
Jeongseon Alpine DH Middle	37.457433	128.601828
Jeongseon Alpine DH Finish	37.464385	128.603100
Bokwang Cross Start	37.578527	128.312698
Bokwang Cross Finish	37.584330	128.322039
Bokwang Slopestyle Start	37.574346	128.323211
Bokwang Slopestyle Finish	37.579428	128.324778
Gangneung Coastal	37.751470	128.890980
Main Stadium	37.666900	128.707500

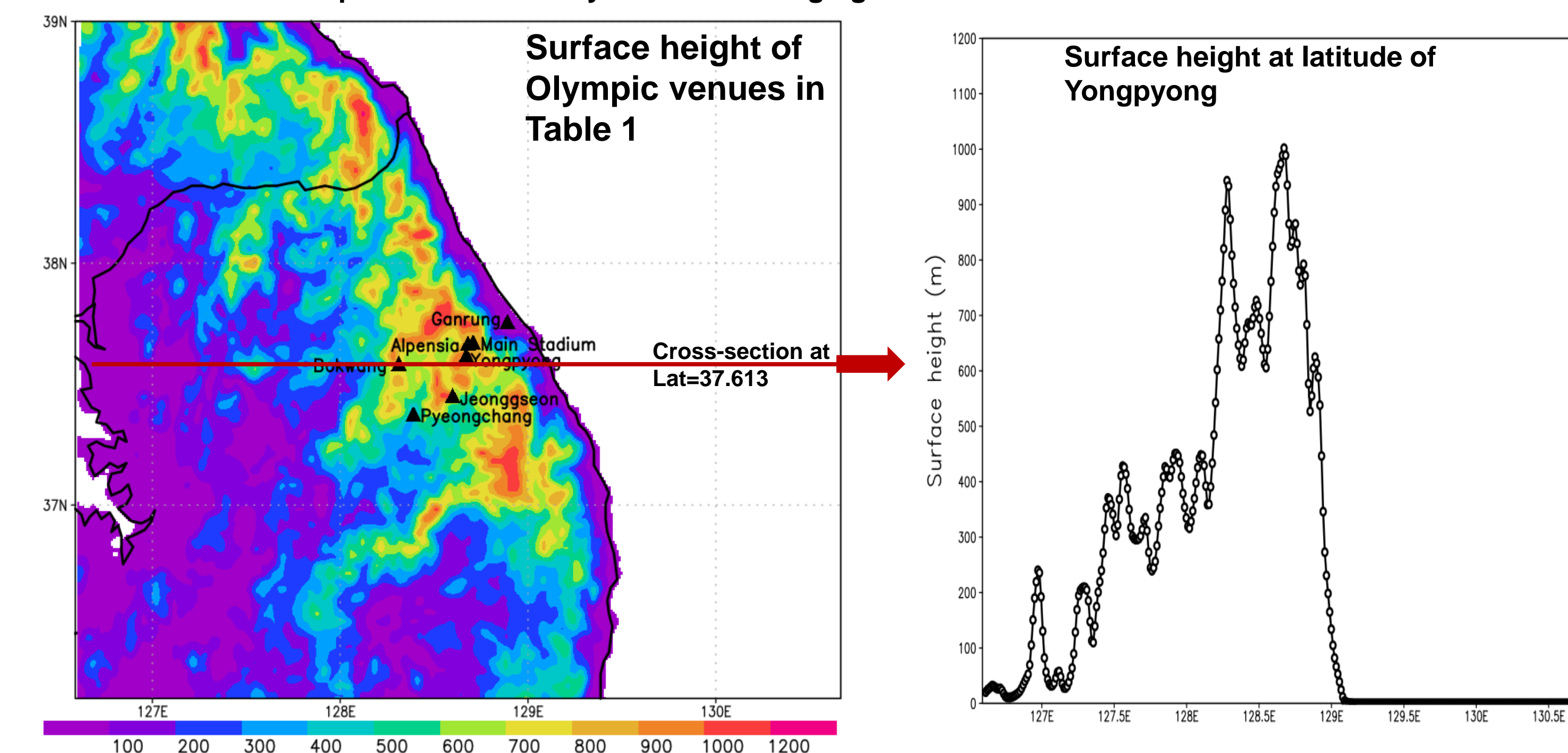


Introduction

- The NASA Unified-Weather Research and Forecasting model (NU-WRF) will be included for testing and evaluation in the forecast demonstration project (FDP) of the International Collaborative Experiment – PyeongChang 2018 Olympic and Paralympic (ICE-POP) Winter Games.
- An international array of radar and supporting ground based observations together with various forecast and nowcast models will be operational during ICE-POP. In conjunction with personnel from NASA's Goddard Space Flight Center, the NASA Short-term Prediction Research and Transition (SPoRT) Center is developing benchmark simulations for a real-time NU-WRF configuration to run during the FDP. ICE-POP observational datasets will be used to validate model simulations and investigate improved model physics and performance for prediction of snow events during the research phase (RDP) of the project
- The NU-WRF model simulations will also support NASA Global Precipitation Measurement (GPM) Mission ground-validation physical and direct validation activities in relation to verifying, testing and improving satellite-based snowfall retrieval algorithms over complex terrain.

NU-WRF Configuration

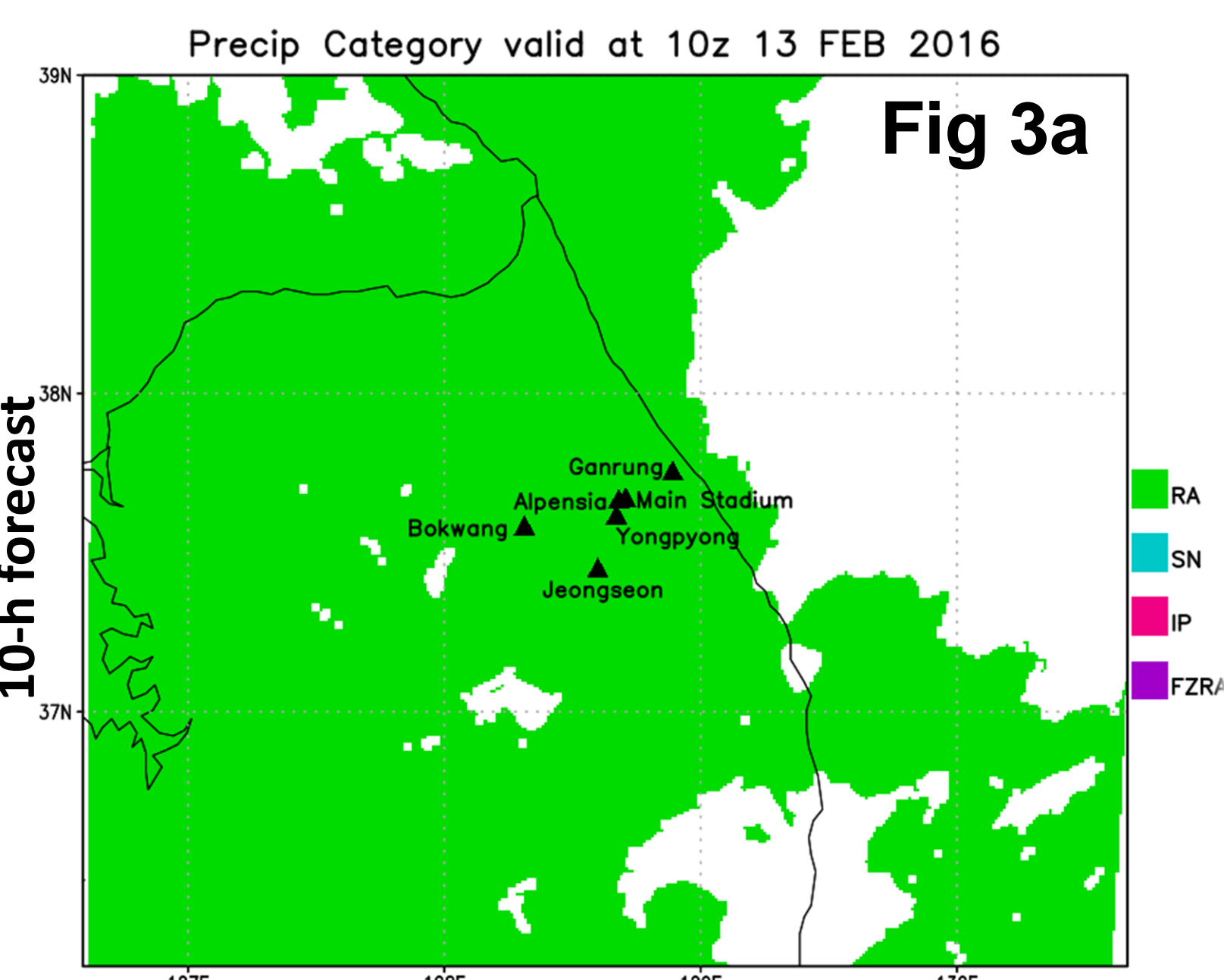
- Three domains (9 km, 3 km, 1 km) at 45-second time step on domain d01
- 62 vertical levels with less than 100 m grid spacing in the lower 2000 m AGL
- Goddard microphysics 4ICE; Goddard short/longwave radiation physics; MYJ PBL; Noah Land surface model
- 24-h forecasts with NASA-Unified Weather Research and Forecasting (NU-WRF) model
- IC & BC provided by NCEP/EMC GFS model both retrospective and future real-time
- Test case results in poster: 13 February 2016 rain changing to snow event in South Korea



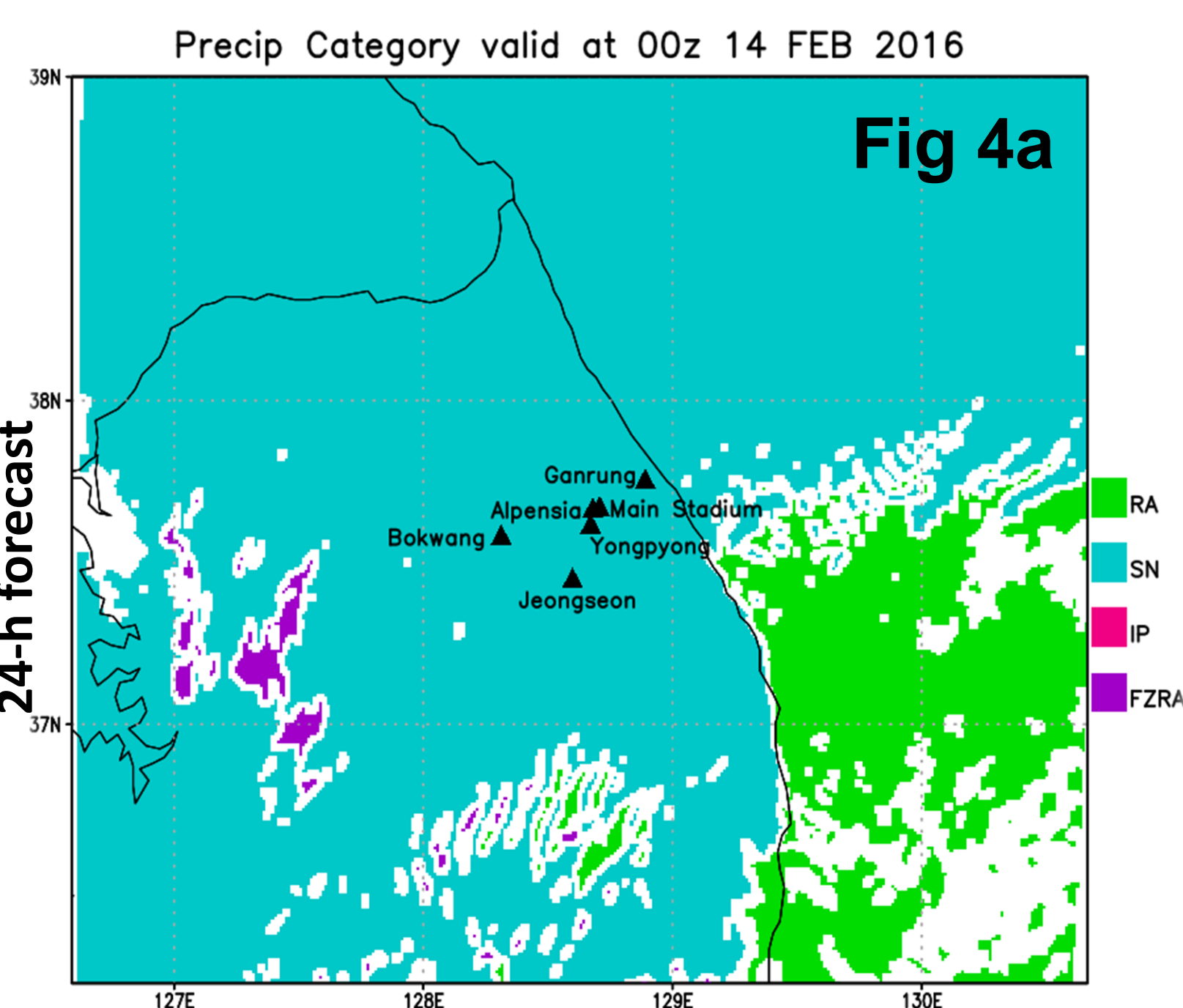
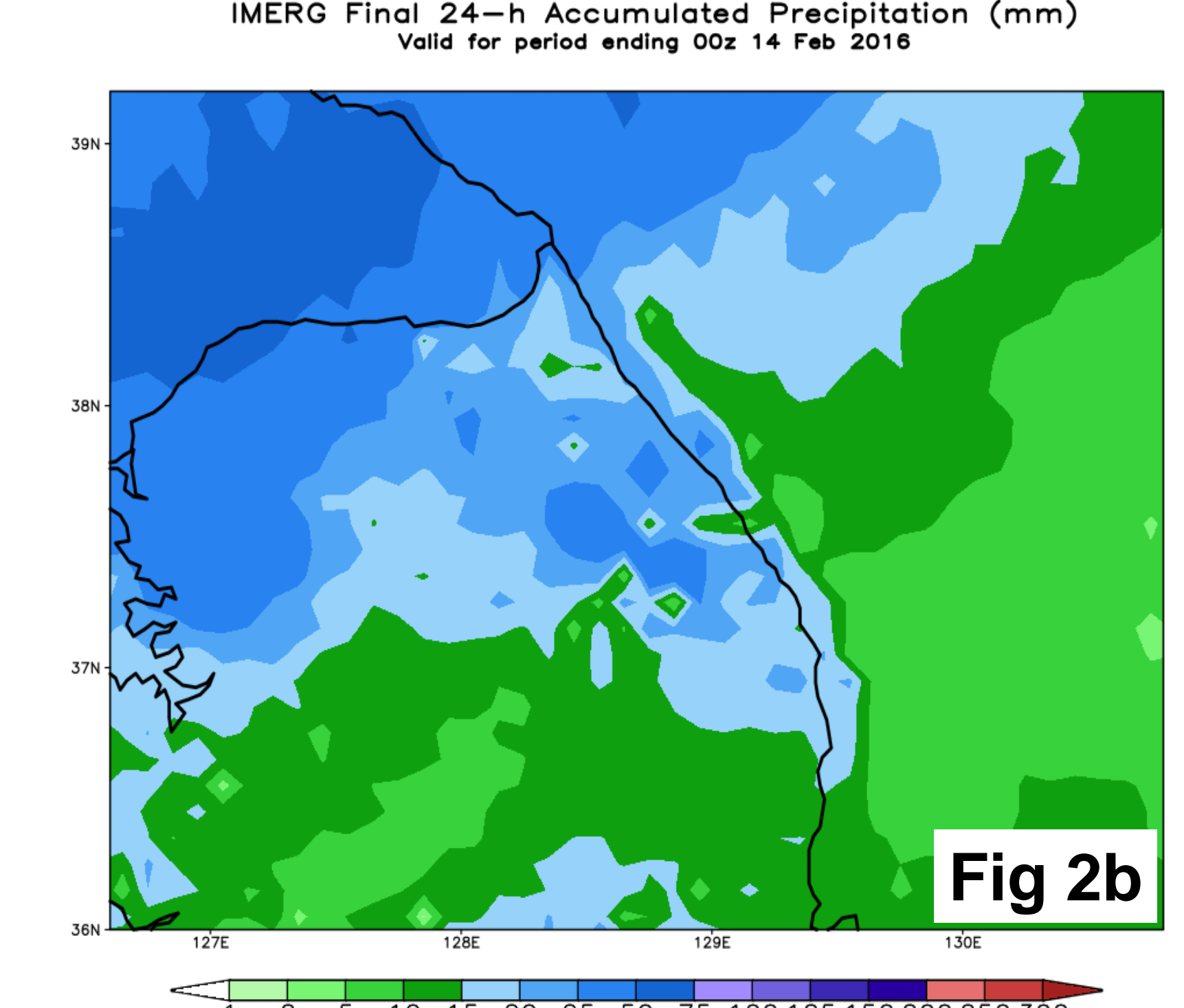
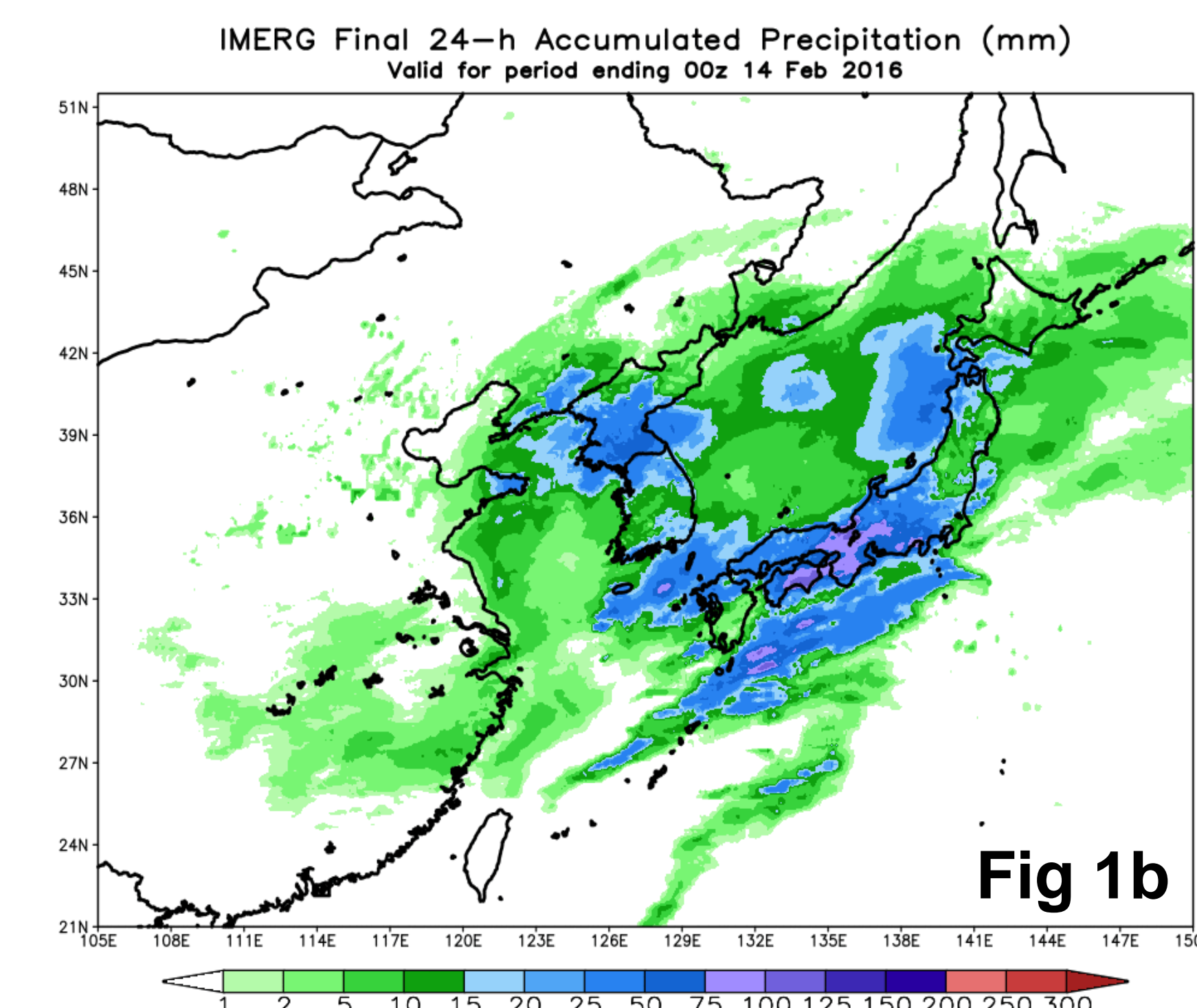
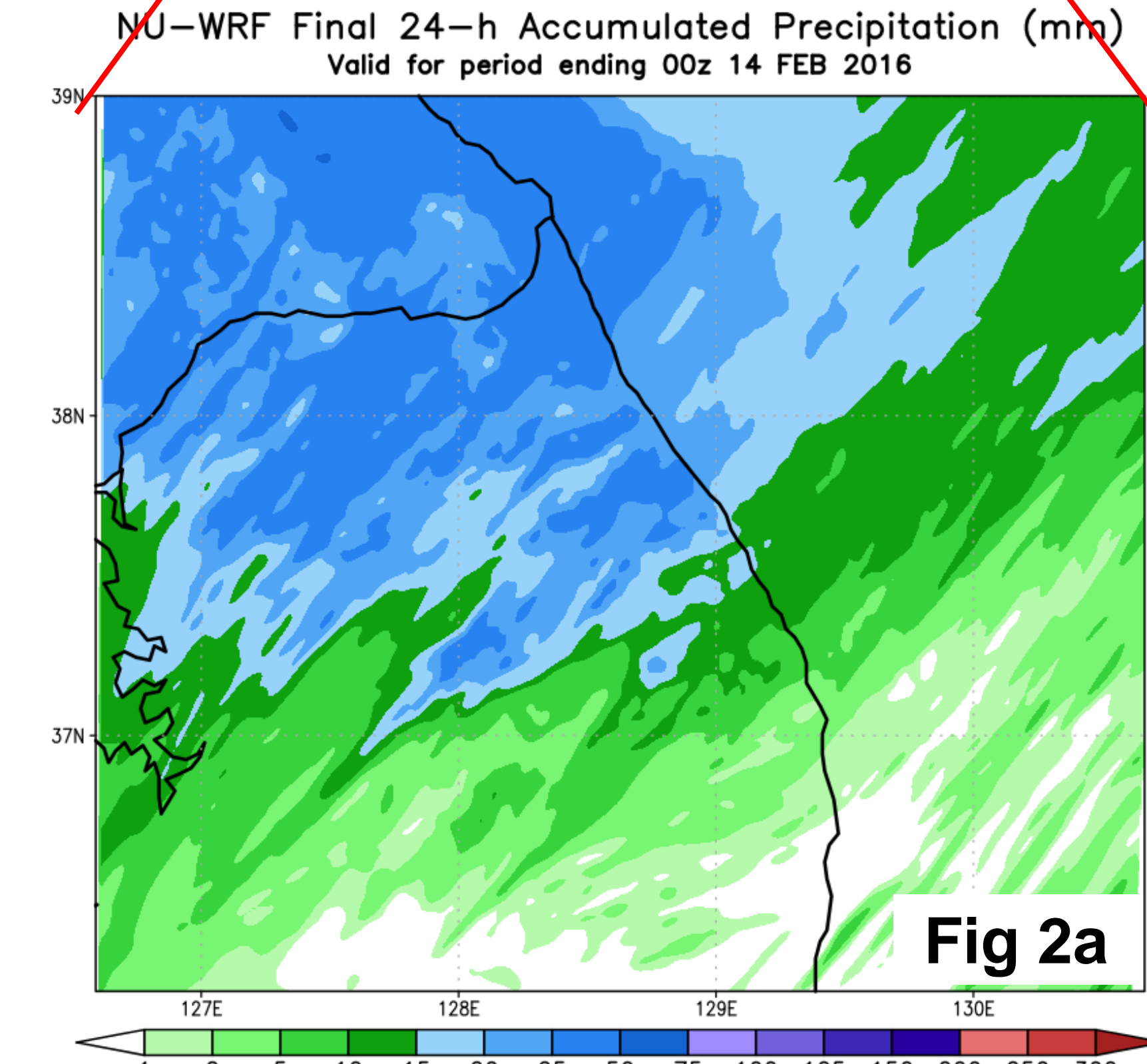
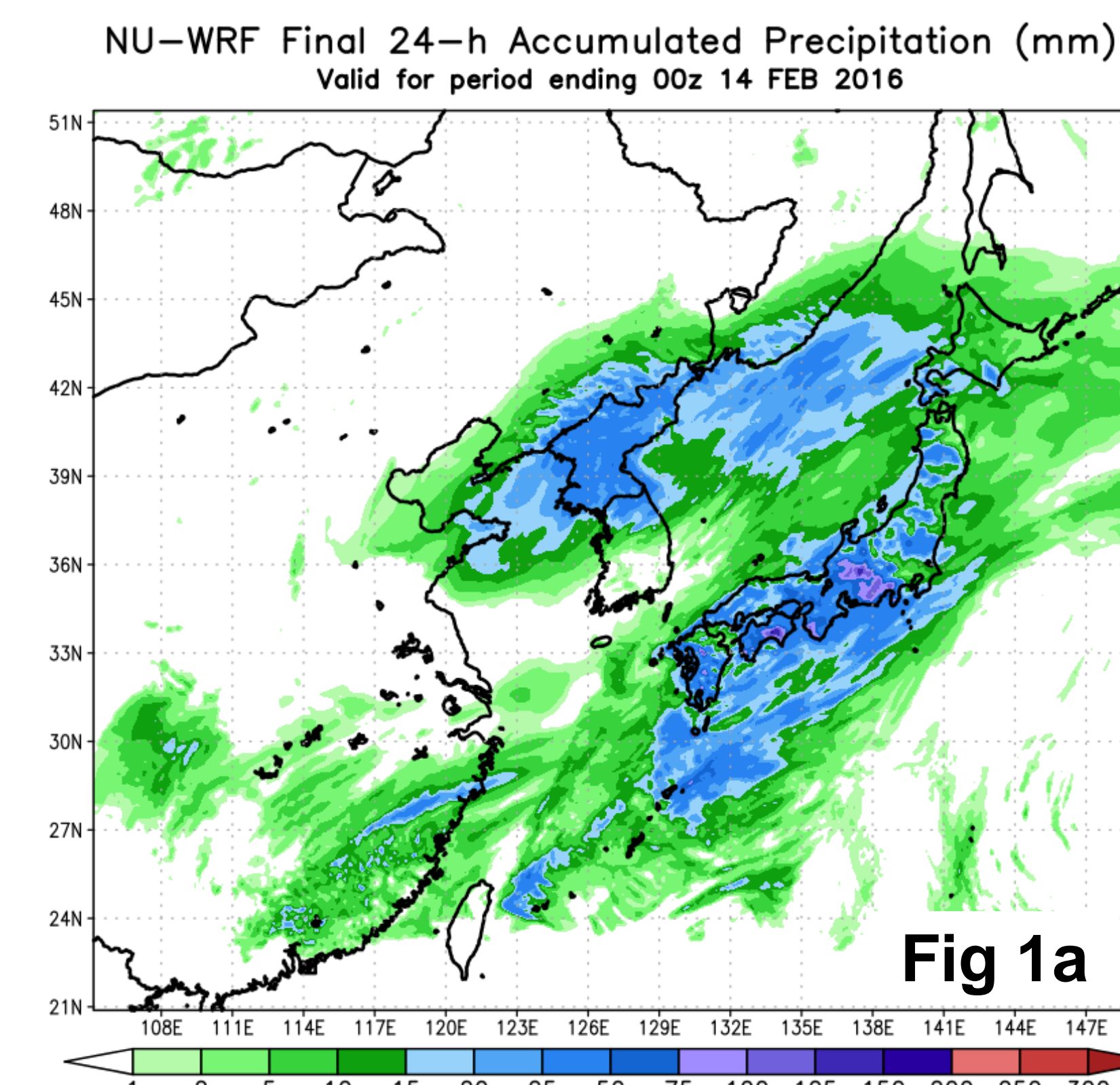
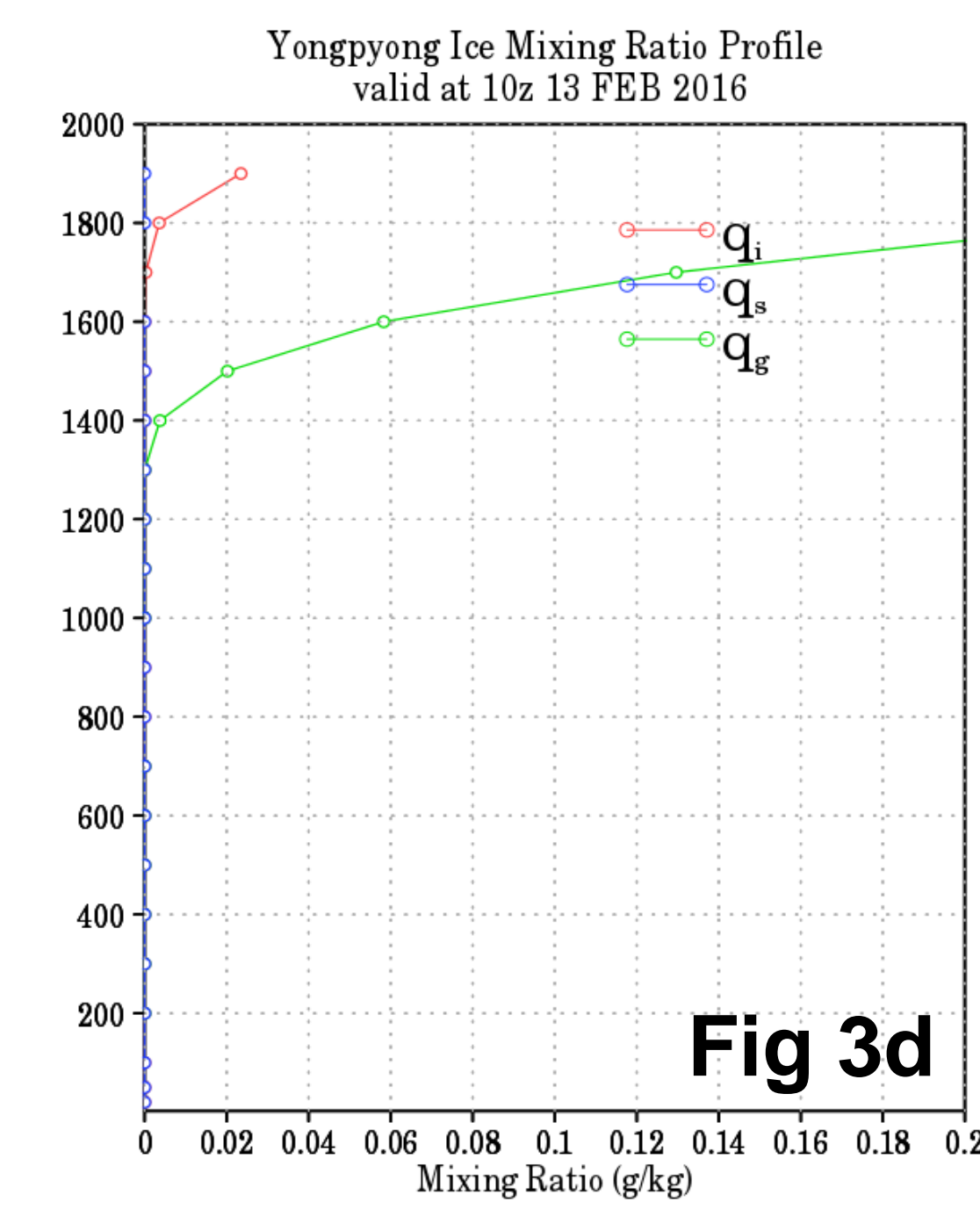
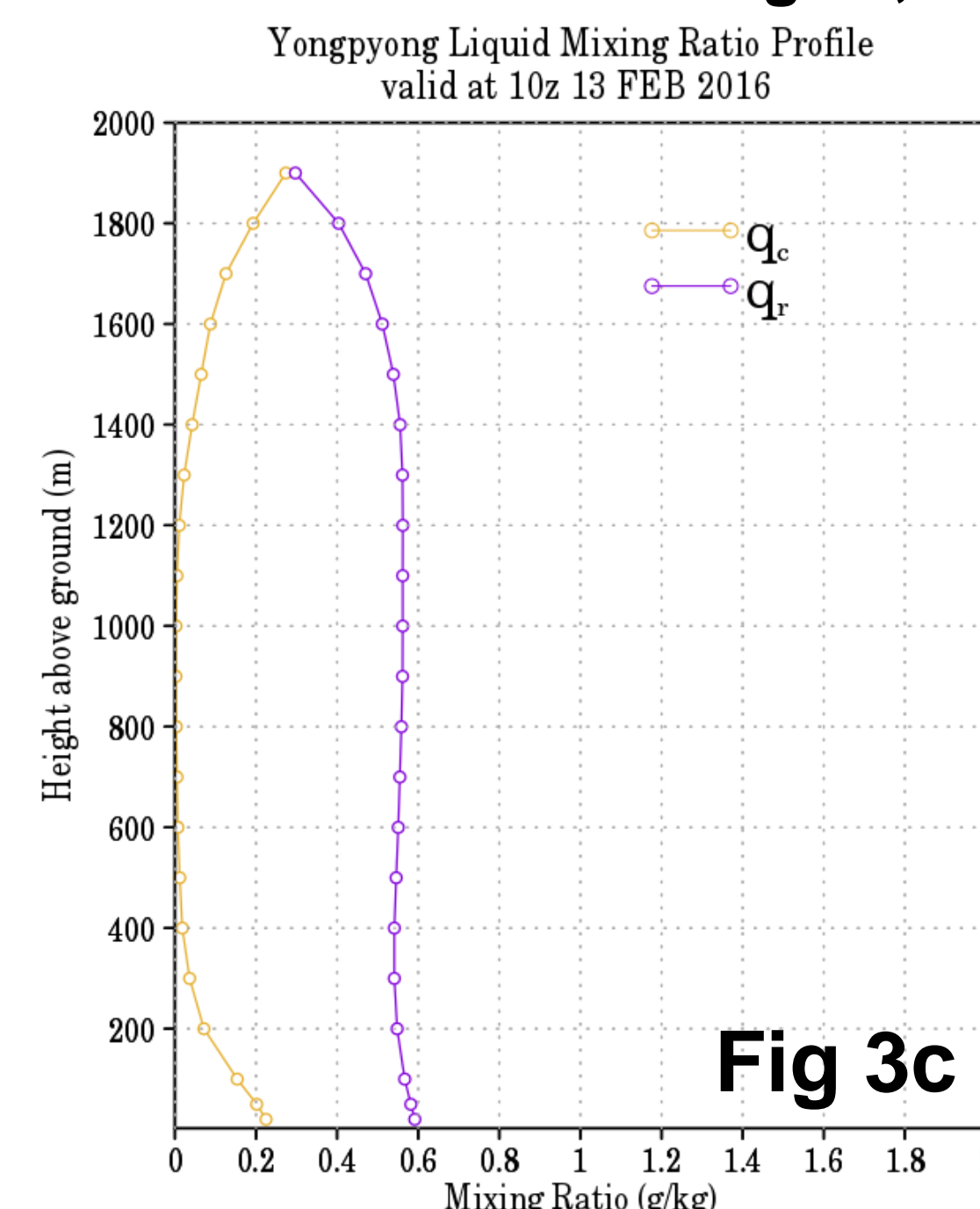
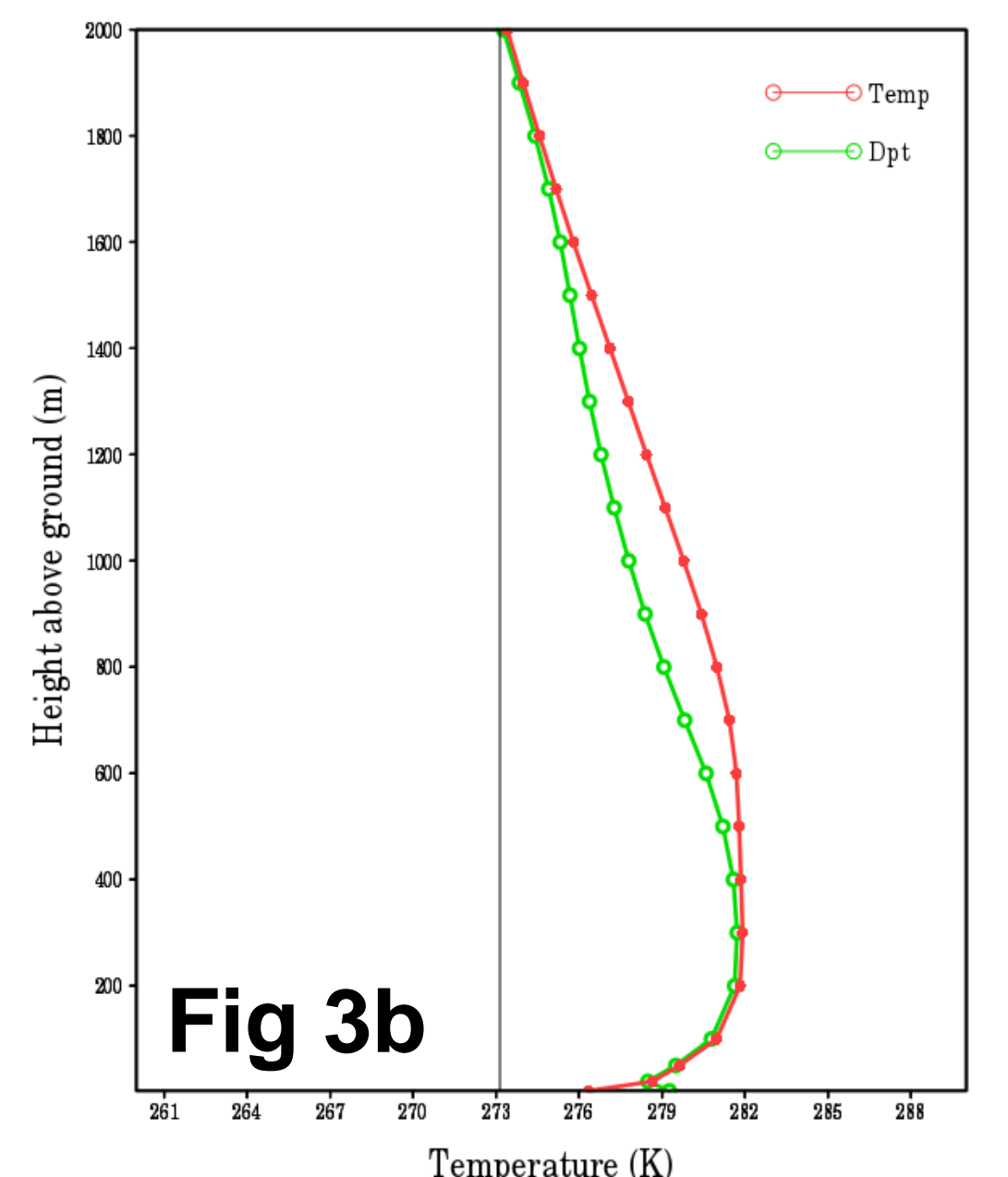
Case Studies: 13 Feb 2016 Snow Event
NU-WRF depicts transition from liquid to frozen precipitation

Fig 1a-Model output compared to Fig 1b GPM IMERG observations for domain D01
Fig 2a-Model output compared to Fig 2b-GPM IMERG observations for domain D03
Fig 3a-10-h Rain forecast model output: Fig 3b-shows T/Td above freezing; Fig 3c-shows the liquid mixing ratio of the rain event; Fig 3d-shows no ice mixing ratio at the lower levels
Fig 4a-24-h Snow forecast model output: Fig 4b-shows T/Td below freezing; Fig 4c-shows no liquid mixing ratio; Fig 4d-shows ice mixing ratio at the lower levels

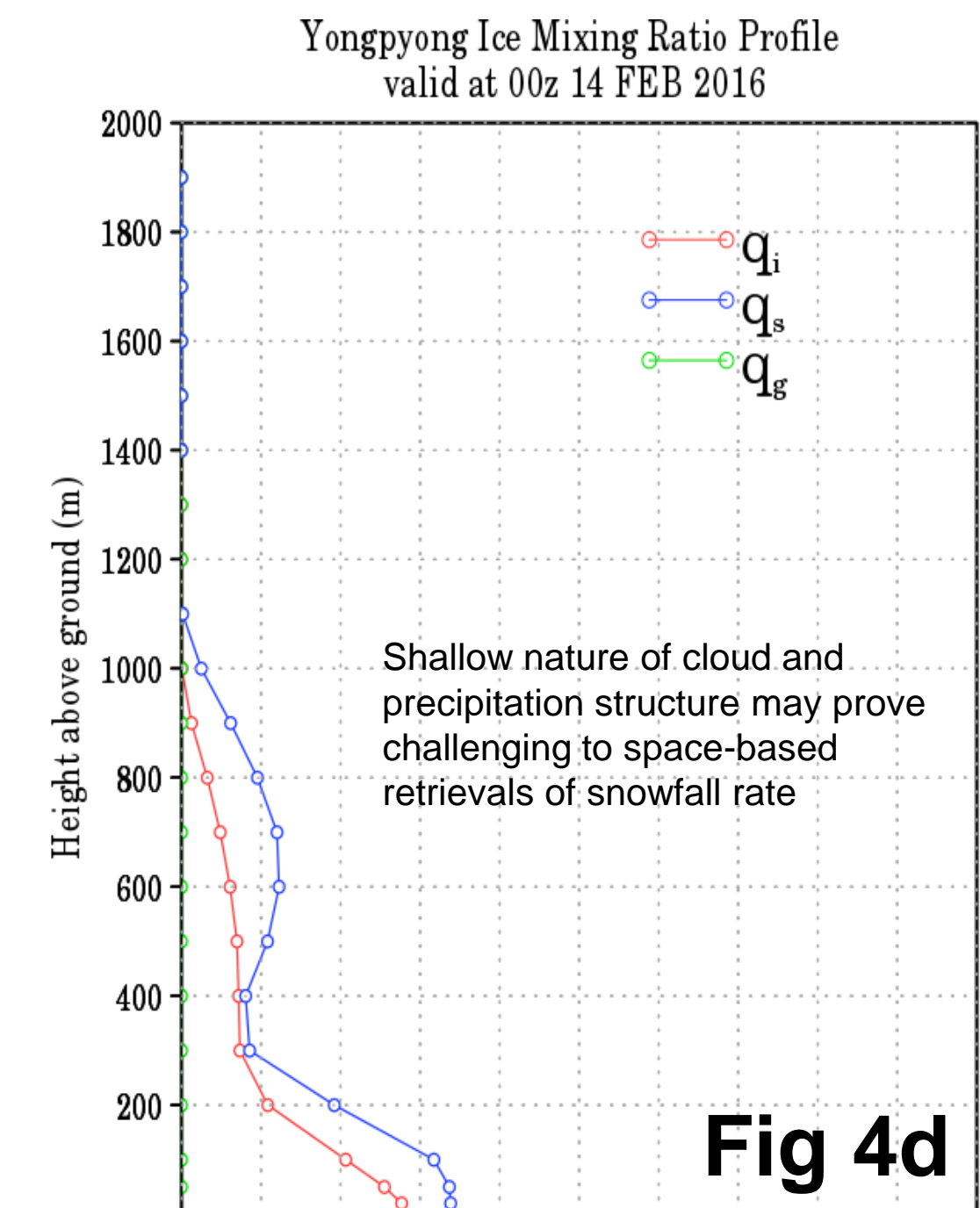
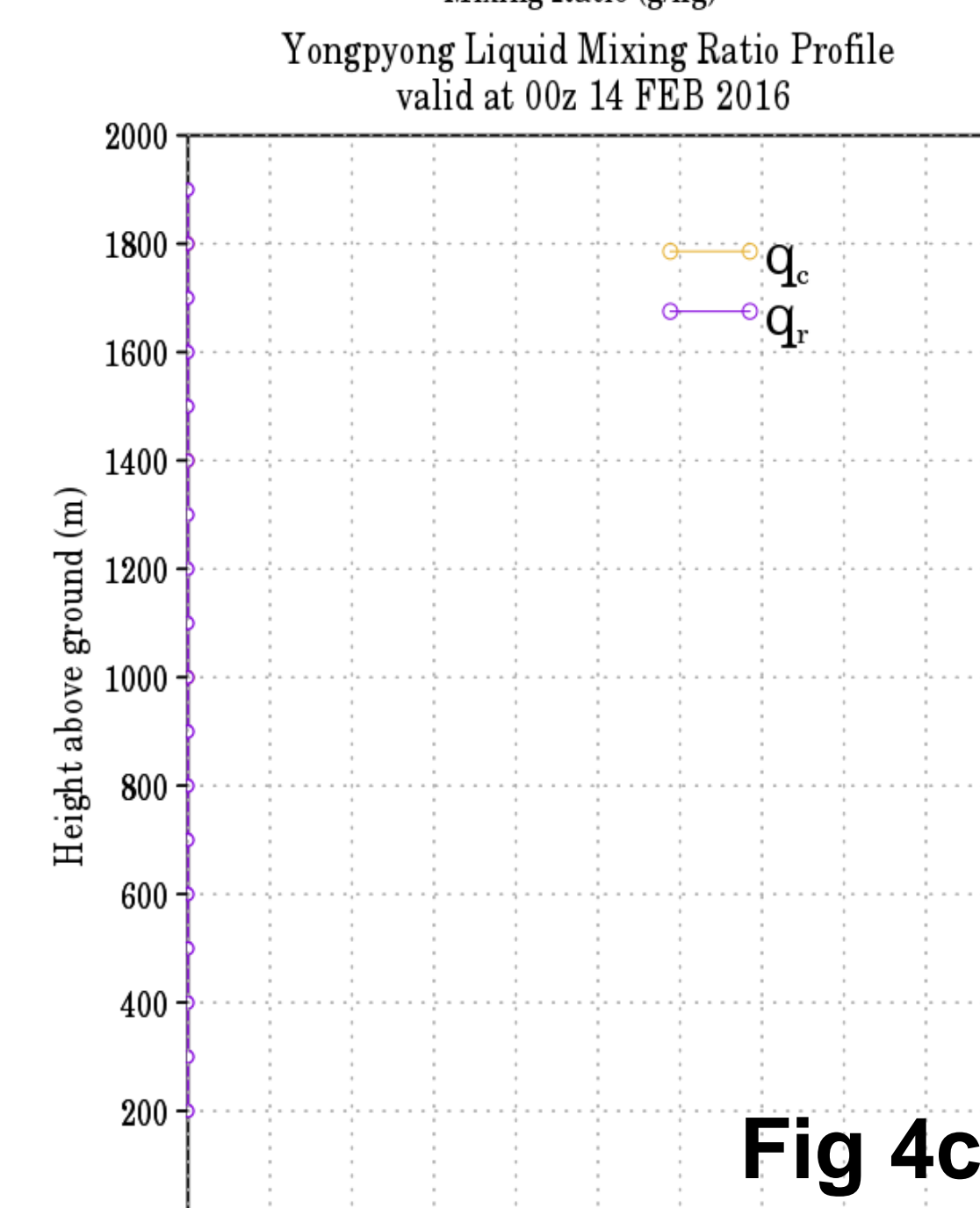
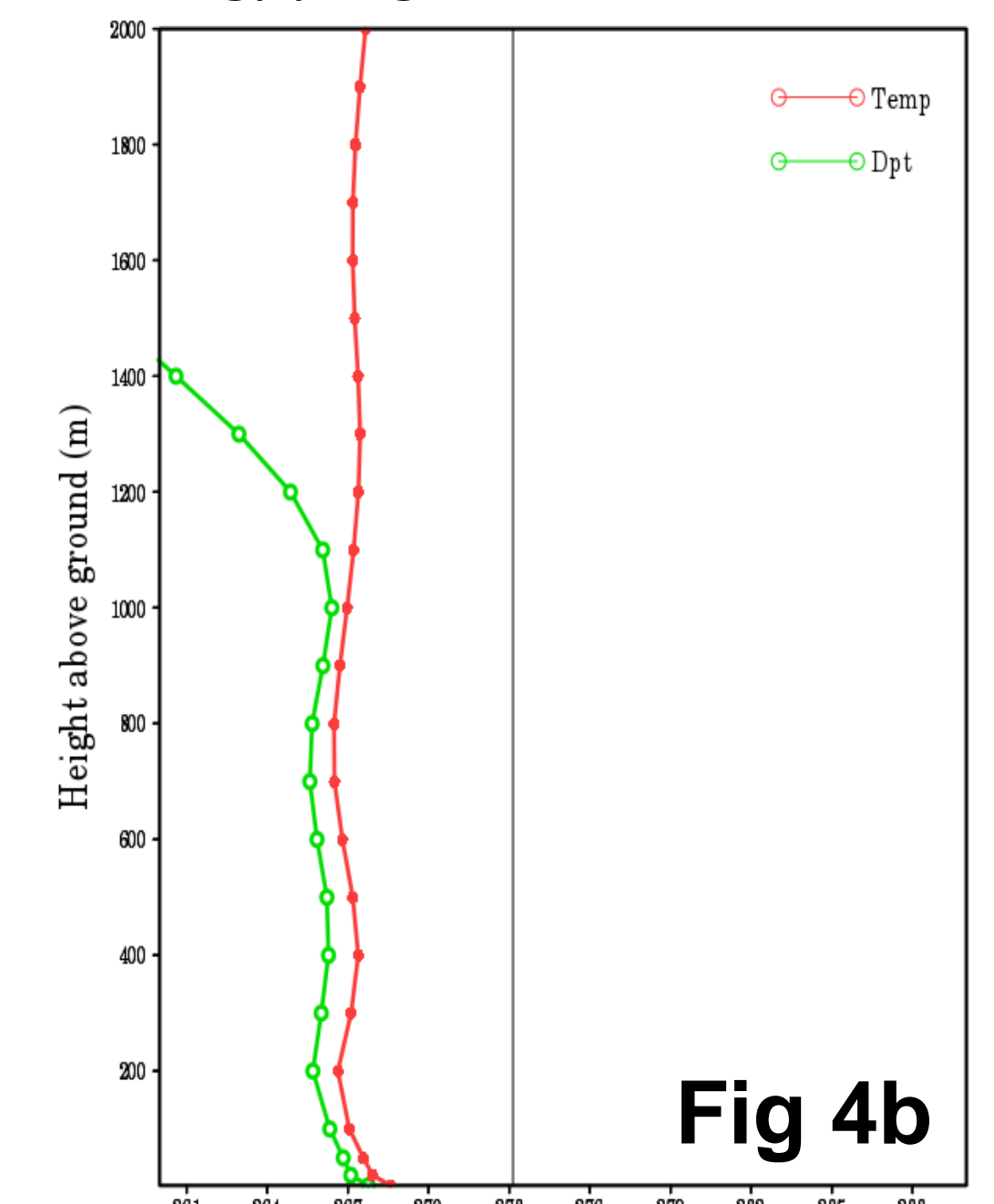
Hydrometeor Profiles : Fig 3c, 3d: 10UTC 13 Feb 2016; Fig 4c, 4d: 00UTC 14 Feb 2016



Yongpyong T/Td Profile: 10-h fcst



Yongpyong T/Td Profile: 24-h fcst



Deliverables

- Four times daily, 24-h forecasts
- Fields at each forecast point:
 - Surface: Precip (amount / type) and visibility
 - 3D: Temp, RH, Wind, hydrometeors every 100 m up to 2 km

Future Work

- Run NU-WRF coupled to Goddard-Satellite Data Simulator Unit (G-SDSU), for testing of process impacts on GPM passive/active remote sensing-based snowfall retrievals and verification of model processes;
- Further testing of terrain resolution impacts for NU-WRF predictability of heavy winter orographic precipitation QPE/F
- Observational validation of NU-WRF to include testing of cloud physics schemes and modeled precipitation process (liquid, mixed phase and frozen)

Acknowledgements

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